

# 지역사회기반 구강기능재활운동의 타당성 및 치과위생사 인력 적정성에 대한 델파이 연구

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## A delphi study on the feasibility of community-based oral function rehabilitation exercises and the dental hygienist workforce adequacy

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**Objectives:** As community-oriented public health in oral healthcare for older adults becomes increasingly emphasized, research into community-based oral function rehabilitation interventions is emerging. This study examined the feasibility of community adoption of a previously developed oral function rehabilitation exercise program using an expert-crafted Delphi survey.

**Methods:** An eight-expert panel was formed to develop a Delphi survey instrument and conduct a survey based on the results of previous studies. To test the community applicability of oral function rehabilitation exercises derived from this systematic review, we asked questions related to 'independent performance', 'education applicability for caregivers', 'facility program applicability', 'intervention methods', and 'outcome indicators'.

**Results:** Except for 'pharyngeal exercise' and 'salivation exercise', the five main exercises met the validity criteria for 'independent performance', 'education applicability for caregivers', and 'facility program applicability'. The validity of dental hygienists as intervention providers obtained consensus from the experts with a CVR value of 0.75 or higher, an agreement of 0.75-0.85, and a convergence of 0.5.

**Conclusions:** The application of oral function rehabilitation exercises in a community setting is feasible, and the dental community should be willing to promote it so that it can be provided to many community-dwelling older adults in the future. In addition, the use of dental hygienists as intervention providers is appropriate. However, their training as intervention providers for oral function rehabilitation exercises may need to be strengthened.

**Key Words:** Aged, Deglutition disorders, Dental hygienists, Mastication, Oral health

## Introduction

To prepare for an ultra-elderly society, the World Health Organization has coined the slogan "Decade of Healthy Aging".

Rather than focusing solely on overcoming disease, this effort aims to maximize the physical, mental, and social functioning of older people so that they can remain as independent as possible in their own homes as they age<sup>1)</sup>.

A growing body of evidence indicates that oral health care is critical for older adults to live a healthy life<sup>2-4</sup>. The World Health Organization has stated that maintaining nutritional status is a key factor in enhancing the vitality of elderly people. In particular, unhealthy oral conditions can contribute to malnutrition<sup>5</sup>. A systematic review of the association between oral health and physical frailty in older adults revealed that oral health in later life is an important predictor of physical frailty<sup>6</sup>. In addition, recent studies have shown an association between poor oral health and sarcopenia, which is a risk factor for healthy aging<sup>7</sup>. Therefore, it is necessary to examine how to manage the oral health of elderly people to maintain a healthy and functional life.

A decline in oral function due to aging is inevitable, so it is important to provide interventions to overcome this issue and provide rehabilitation<sup>8</sup>. The concept of geriatric oral function rehabilitation has focused mainly on hospital-based therapeutic interventions, such as denture restoration and implant placement<sup>9,10</sup>. However, with the social policy that establishes that services for the healthy living of elderly people should be community-oriented, oral health care for elderly people has changed<sup>11</sup>. The role of community-oriented public health has been emphasized in the oral health care of elderly people through the concept of traditional hospital-based treatment<sup>12</sup>, and community-based interventions for the rehabilitation of oral function are becoming increasingly important<sup>13</sup>.

Oral exercises that strengthen the muscles of the orofacial region are common community-based interventions for oral function rehabilitation in older adults<sup>14</sup>. Many studies of oral exercise have been conducted to improve oral function in elderly people. In a study by Kim et al.<sup>15</sup>, community-dwelling elderly people aged 65 years and older performed masticatory exercises. The study found improvements in occlusal force and masticatory muscle thickness. Shirobe et al.<sup>16</sup> found that an oral exercise program that included oral preparation, mouth opening, tongue pressure training, rhyme training, and mastication training improved tongue pressure and articulation function in community-dwelling older adults. Furthermore, Takano et al.<sup>17</sup> found that masticatory muscle strengthening exercises using a mouthpiece improved occlusal force, muscle thickness, and masseter muscle echo intensity in people aged 65 and older.

Although oral exercises have demonstrated various levels of efficacy in the framework of clinical studies, questions remain about the effectiveness of these interventions in improving the health of the elderly population due to many confounding variables in real-world settings. Therefore, practical ways of evaluating effectiveness in community settings must be considered,

and a consensus among experts is needed.

The literature indicates that personnel providing oral function rehabilitation exercise (OFRE) interventions in the community include dentists, dental hygienists, occupational therapists, speech therapists, and senior living facility staff, with dental hygienists making up the largest proportion of these personnel<sup>18</sup>. However, 52.3% of previous studies (11 studies) lacked information on the intervention provider, making it difficult to determine the current status of oral motor intervention providers. The expertise and role of the interventionist in providing various services in the community can be an important factor in determining the quality of the intervention services provided. This study aims to investigate the feasibility of implementing OFREs in the community and the adequacy of dental hygienist workforce through expert Delphi survey.

## Materials and Methods

### 1. Subjects and methods

#### 1.1. Recruitment of Delphi survey subjects

A panel of eight experts in geriatric dentistry and geriatric dental hygiene was formed to conduct the Delphi survey for this study. The selection criteria for the expert panel were as follows. First, the panel was composed of experts with doctoral degrees in the fields of dentistry and dental hygiene, reflecting the aim of this study of verifying the validity of oral function rehabilitation for elderly people. Second, we included professors in related fields who could respond to the theoretical basis and practical characteristics of oral function rehabilitation. Third, experts with more than 10 years of teaching experience and research experience in their major field were included to utilize their professional qualities. Fourth, the number of panelists was set to 8 to minimize error in the survey results while considering the risk of a low return rate in repeated survey procedures (Table 1). While the panel size of eight experts may appear relatively small, it is within the commonly accepted range for Delphi studies, which typically include 7–15 experts. This size ensures a balance between depth of insight and practicality in managing iterative survey processes. Moreover, the rigorous selection criteria employed in this study ensured that all panel members possessed exceptional academic and professional expertise relevant to the research topic. This study was approved by the Institutional Review Board of SunMoon University (SM-202211-046-1).

**Table 1.** List of the panel of experts for the Delphi survey

Panel	Fields	Job title	Education	Career
Panel A	Dentistry	Professors (clinicians)	PhD	26 years
Panel B	Dentistry	Professors (clinicians)	PhD	25 years
Panel C	Dentistry	Professors	PhD	17 years
Panel D	Dentistry	Adjunct Professor (clinician)	PhD	11 years
Panel E	Dental Hygiene	Associate Professor	PhD	13 years
Panel F	Dental Hygiene	Associate Professor	PhD	13 years
Panel G	Dental Hygiene	Assistant Professor	PhD	11 years
Panel H	Dental Hygiene	Assistant Professor	PhD	11 years

Definition		
<b>Oral function rehabilitation exercise (OFRE) system</b> It refers to rehabilitation exercises that prevent, restore, and improve disorders of body function and structure, activities, and participation components by improving oromaxillofacial strength, endurance, and flexibility by the application of various types of exercises to the oromaxillofacial region. This self-exercise that can be performed by the target person in a community setting to prevent oromaxillofacial muscle disorders and promote recovery and improvement of function.		
Intervention domain	Definition	Intervention subdomain
Oral function rehabilitation warm-up exercise	This is a warm-up exercise before starting OFREs to activate oral function. It can include exercises to stretch (relax) the oromaxillofacial muscle on your own, such as opening your mouth as wide as possible or blowing on your cheeks.	Oromaxillofacial muscle stretching exercise
Masticatory function exercise	This exercise improves temporomandibular joint movement, masticatory muscle strength, and muscle endurance to improve masticatory function, and increases tongue movement to help chew food.	Chewing exercise using non-cariogenic foods or materials
		Masseter muscle strengthening exercise
Swallowing function exercise	Exercises that strengthen the muscle strength, endurance and coordination of the tongue to improve swallowing function.	Tongue strengthening exercise
		Swallowing exercise
	Exercises that strengthen the muscle strength, endurance and coordination of the lip to improve swallowing function.	Lip strengthening exercise
	Exercises that strengthen the muscle strength, endurance and coordination of the pharyngeal muscles to improve swallowing function.	Head flexing exercise
Articulatory function exercise	Exercises that strengthen the muscle strength, endurance and coordination of the respiratory muscles to improve swallowing function.	Respiratory muscle strength exercise
Articulatory function exercise	This exercise promotes tongue and lip movements to improve articulatory function.	Syllable articulation exercise
Salivary function exercise	This exercise stimulates the salivary glands (parotid, submandibular, and lingual) to improve salivation.	Salivary gland massage
Oral function rehabilitation cool-down exercise	This exercise is performed after the OFREs to reduce muscle fatigue. It can include exercises to stretch (relax) the oromaxillofacial muscle on your own, such as opening your mouth as wide as possible or blowing on your cheeks.	Oromaxillofacial muscle stretching exercise

**Fig. 1.** Finalized OFRE system.

## 1.2. Delphi survey development

Based on a previous systematic review of 19 studies, we summarized outcome indicators for evaluating the effectiveness of oral exercise interventions and defined the concept and intervention domains of OFREs using the International Classification of Functioning, Disability, and Health (ICF) model (Fig. 1). Subsequently, to assess the suitability of implementing developed OFREs in the community, we designed the following

items for investigation. First, to evaluate whether older adults can perform the exercises independently without caregiver assistance, we developed items related to ‘self-exercise applicability.’ Second, to assess the suitability of educating caregivers for older adults at home or in facilities, we developed items related to ‘applicability of caregiver education.’ Third, to evaluate the appropriateness of implementing OFREs in senior activity programs in facilities, we developed items related to ‘facility

program applicability.’ To establish the appropriate exercise duration, frequency, and outcome indicators for the developed OFREs, we reviewed and summarized intervention durations, frequencies, and outcome measures from previous studies. Based on this, we developed evaluation items to enable experts to assess them based on their clinical experience. Finally, we developed items to assess the suitability of dental personnel, including dentists and dental hygienists, who provide the developed OFREs. All Delphi questionnaire items were evaluated on a 5-point Likert scale (1=not appropriate at all to 5=highly appropriate), with higher scores considered as positive evaluations.

### 1.3. Delphi survey process

To facilitate understanding of the study, we created a study participation guide that explained the purpose, research team, participation method, and duration of the study (writing guidelines, video on the Delphi evaluation method) and sent it to all experts by email along with the first round of Delphi survey questions. The first Delphi survey was conducted for approximately 14 days, from December 6, 2022 to December 22, 2022. The second Delphi survey was conducted for approximately 18 days, from January 13, 2023 to January 31, 2023. For the second survey, we presented the mean and median results of the first survey and emailed the survey results to the respondents along with the answers they provided at the time of the first survey, thereby giving them the opportunity to revise their opinions. Informed consent was obtained from all participants prior to the survey.

### 1.4. Analysis method

Content validity was analyzed to confirm the validity of community applicability and the intervention providers of the OFREs. Content validity was subdivided into the content validity ratio (CVR), content validity index (CVI), degrees of convergence, degrees of agreement, and coefficient of variation. Content validity was analyzed to confirm the applicability of the OFREs. Data analysis was performed using Microsoft Office Excel 2019.

## Results

### 1. Content validity for each intervention domain

The final Delphi results for the applicability of each intervention domain are shown in Table 2. The results of the content validity assessment for the OFRE intervention to improve oral function in older adults showed that all interventions had a CVR value of 0.75 or greater, a consensus of 0.75 to 1.00, and a

convergence of 0.5 or less. Regarding the applicability of interventions in each domain, the results of the content validity of self-exercise applicability showed that all intervention domains had a CVR value of 0.75 or more, a consensus of 0.75–0.95, and a convergence of 0.50 or less, except for ‘swallowing exercises [pharyngeal exercises]’ and ‘oral function rehabilitation cool down exercises’. For ‘swallowing exercises [pharyngeal exercises]’ and ‘oral function rehabilitation cool-down exercises’, the median value was 4.00, indicating positive results; however, the CVRs were 0.25 and 0.50, respectively, which did not meet the content validity criteria. In the content validity of the applicability of caregiver education, all intervention domains showed consensus among the experts with a CVR of 0.75 or more, a consensus of 0.80 to 0.95, and a convergence of 0.50 or less, except for ‘swallowing exercises [pharyngeal exercises]’, ‘salivary function exercises’, and ‘oral function rehabilitation cool down exercises’. For ‘swallowing [pharyngeal] exercise’, ‘salivary function exercise’, and ‘oral function rehabilitation cool down exercise’, the median value was greater than 4.50, indicating positive results; however, the CVR was 0.50, which did not meet the content validity criteria. In the content validity of the applicability of the care facility program, all interventions except ‘salivary function exercise’ and ‘oral function rehabilitation cool down exercise’ had a CVR of 0.75 or more, with a consensus of 0.80 to 0.95 and a convergence of 0.50 or less. For ‘salivary function exercise’ and ‘oral function rehabilitation organizer exercise’, the median value was 5.00, indicating positive results; however, the CVR was 0.50, which did not meet the content validity criteria.

### 2. Intervention provider

Except for the item concerning the provision of ‘masticatory exercises’ by dental personnel, all other items showed a CVR value of 0.75 or higher, a consensus ranging from 0.75 to 0.80, and a convergence of 0.5 among experts. For the workforce adequacy of dental personnel in masticatory exercises’, although the CVR was 0.50, indicating a failure to meet the CVR criterion, the median value was 4.50, confirming positive results (Table 3).

The experts’ opinions on the workforce are summarized in Supplementary Table 1. For the oral function rehabilitation movement to become active, it was suggested that educational programs should be prepared for community caregivers and that the expertise of dental hygienists should be strengthened.

**Table 2.** Results of the final round of Delphi on intervention effectiveness and applicability

	Mean±SD	Median	Q1-Q3	CVI	CVR	Degree of convergence	Degree of agreement	CV
Oral function rehabilitation warm-up exercise								
Self-exercise applicability	4.25±0.66	4.00	4.00-5.00	0.88	0.75	0.50	0.75	0.16
Education applicability for caregivers	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Facility program applicability	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Masticatory function exercise								
Self-exercise applicability	4.38±0.70	4.50	4.00-5.00	0.88	0.75	0.50	0.78	0.16
Education applicability for caregivers	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Facility program applicability	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Swallowing function exercise (tongue exercise)								
Self-exercise applicability	4.63±0.48	5.00	4.00-5.00	1.00	1.00	0.50	0.80	0.10
Education applicability for caregivers	4.63±0.70	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.15
Facility program applicability	4.63±0.70	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.15
Swallowing function exercise (lip exercise)								
Self-exercise applicability	4.63±0.70	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.15
Education applicability for caregivers	4.63±0.70	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.15
Facility program applicability	4.63±0.70	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.15
Swallowing function exercise (pharyngeal exercise)								
Self-exercise applicability	3.88±0.78	4.00	3.00-4.25	0.63	0.25	0.63	0.69	0.20
Education applicability for caregivers	4.25±0.83	4.50	3.75-5.00	0.75	0.50	0.63	0.72	0.20
Facility program applicability	4.13±1.05	4.50	3.75-5.00	0.75	0.50	0.63	0.72	0.26
Swallowing function exercise (respiratory muscle exercise)								
Self-exercise applicability	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Education applicability for caregivers	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Facility program applicability	4.50±1.00	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.22
Articulatory function exercise								
Self-exercise applicability	4.38±0.70	4.50	4.00-5.00	0.88	0.75	0.50	0.78	0.16
Education applicability for caregivers	4.50±0.71	5.00	4.00-5.00	0.88	0.75	0.50	0.80	0.16
Facility program applicability	4.50±1.00	5.00	4.75-5.00	0.88	0.75	0.13	0.95	0.22
Salivary function exercise								
Self-exercise applicability	4.38±0.70	4.50	4.00-5.00	0.88	0.75	0.50	0.78	0.16
Education applicability for caregivers	4.38±0.86	5.00	3.75-5.00	0.75	0.50	0.63	0.75	0.20
Facility program applicability	4.25±0.97	5.00	3.00-5.00	0.63	0.25	1.00	0.60	0.23
Oral function rehabilitation cool-down exercise								
Self-exercise applicability	4.29±0.70	4.00	4.00-5.00	0.75	0.50	0.50	0.75	0.16
Education applicability for caregivers	4.57±0.73	5.00	4.50-5.00	0.75	0.50	0.25	0.90	0.16
Facility program applicability	4.57±0.73	5.00	4.50-5.00	0.75	0.50	0.25	0.90	0.16

SD, standard deviation; Q1, quartile1; Q3, quartile; CVI, content validity index; CVR, content validity ratio; CV, coefficient of variation.

### 3. Results of the appropriate frequency and duration of exercise

With regard to the appropriate number and duration of sessions for each intervention domain, based on the results of the final expert Delphi, we reached the following conclusions. For 'masticatory exercises', it is suggested to perform 3 to 4 reps per set with 2 sets per day, 3 to 4 times per week for 6 weeks. For 'swallowing [tongue, lips, and pharynx]', it is recommended to perform 3 to 4 repetitions per set with 2 sets per day, 3 times per week for 6 weeks. For 'swallowing [respiratory muscle exercises]', the CVR was not met. We therefore considered the median and CVI and finally decided to recommend performing 3-4 reps per set with 2 sets per day, 3 times per week for 6 weeks.

For 'articulatory function exercises', it is suggested that 3-4 reps are performed per set with 2 sets per day, 3 times per week for 6 weeks. For 'salivary function exercises', 3-4 reps should be performed per set with 2 sets per day, 3 times per week for 8 weeks (Table 4). For the outcome indicators for each intervention domain, based on the results of the final expert Delphi survey, the following results were derived after discussions among the internal researchers (Table 5). These outcome measures had a CVR of 0.75 or more, consensus of 0.75 or more, and convergence of 0.5 and can be used to confirm the effectiveness of each intervention domain.

**Table 3.** Delphi survey results for intervention provider

	Mean±SD	Median	Q1-Q3	CVI	CVR	Degree of convergence	Degree of agreement	CV
Oral function rehabilitation warm-up exercise								
Dental personnel	4.25±0.66	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.16
Dental hygienist	4.50±0.71	5.00	4.00–5.00	0.88	0.75	0.50	0.80	0.16
Masticatory function exercise								
Dental personnel	4.13±1.05	4.50	3.75–5.00	0.75	0.50	0.63	0.72	0.26
Dental hygienist	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Swallowing function exercise (tongue exercise)								
Dental personnel	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Dental hygienist	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Swallowing function exercise (lip exercise)								
Dental personnel	4.13±0.93	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.22
Dental hygienist	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Swallowing function exercise (pharyngeal exercise)								
Dental personnel	4.13±0.93	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.22
Dental hygienist	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Swallowing function exercise (respiratory muscle exercise)								
Dental personnel	4.13±0.93	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.22
Dental hygienist	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Articulatory function exercise								
Dental Personnel	4.25±0.66	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.16
Dental hygienist	4.38±0.70	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.16
Salivary function exercise								
Dental Personnel	4.25±0.97	4.50	4.00–5.00	0.88	0.75	0.50	0.78	0.23
Dental hygienist	4.38±0.99	5.00	4.00–5.00	0.88	0.75	0.50	0.80	0.23
Oral function rehabilitation cool-down exercise								
Dental personnel	4.25±0.66	4.00	4.00–5.00	0.88	0.75	0.50	0.75	0.16
Dental hygienist	4.50±0.71	5.00	4.00–5.00	0.88	0.75	0.50	0.80	0.16

SD, standard deviation; Q1, quartile1; Q3, quartile; CVI, content validity index; CVR, content validity ratio; CV, coefficient of variation.

**Table 4.** Results of the final round of Delphi on the appropriate frequency and duration of exercise

	Repetitions/set	Sets/day	Times/week	Intervention period
Masticatory function exercise	3–4	2	3	6–7
Swallowing function exercise				
Tongue	3–4	2	3	6–7
Lip	3–4	2	3	6–7
Pharyngeal	3–4	2	3	6–7
Respiratory muscle	3–4	2	3	6–7
Articulatory function exercise	3–4	2	3	6–7
Salivary function exercise	3–4	2	3	8

## Discussion

In this study, a Delphi survey was conducted among experts to confirm the applicability of the developed OFRE to community settings and to confirm the validity of the intervention.

The Delphi results confirmed the appropriateness of self-exercise, caregiver education, and facility programs for all exercises except pharyngeal and salivation exercises. In pharyngeal exercise, the pharyngeal muscles are activated by bending the head and performing resistance exercises with the palm of

the hand on the forehead<sup>19)</sup> in addition to effort swallowing exercise with the head tilted at 80% of its maximum angle<sup>20)</sup>. Both of these exercises activate the pharyngeal muscles. Effortful swallowing exercises, especially after tilting the head to a certain angle, may be difficult for elderly people to perform accurately as self-exercises. Self-exercises should be more reproducible than group exercises performed under the supervision of an intervention provider and should be uncomplicated and easy to understand, especially in the case of self-exercises for older adults<sup>21)</sup>. Adverse reactions can also occur, especially



**Table 5.** Results of the final round of Delphi on the appropriate outcome indicators

Outcome indicators	
Masticatory function exercise	Maximum occlusal force, masticatory ability, discomfort of mastication (self-reported), discomfort of swallowing (self-reported), discomfort of dry mouth (self-reported)
Swallowing function exercise	
Tongue	Maximum tongue pressure, tongue pressure during swallowing, EAT-10, maximum lip closure force
Lip	Maximum lip closure, buccinator muscle strength, SWAL-QOL
Pharyngeal	EAT-10
Respiratory muscle	FVC, FEV1, FIV1
Articulatory function exercise	DDK test
Salivary function exercise	Saliva flow rate, discomfort of dry mouth (self-reported)

EAT-10, eating assessment tool-10; SWAL-QOL, swallowing-quality of life; FVC, forced vital capacity; FEV1, forced expiratory volume in 1s; FIV1, forced inspiratory volume in 1s; DDK, diadochokinetic test.

when exercises are performed with improper posture and head angle<sup>22)</sup>. Therefore, it is necessary to develop exercise aids and educational programs to help elderly people perform pharyngeal exercises on their own to increase the reproducibility of the exercises and to help them perform them in the correct posture. Kim<sup>23)</sup> developed a shoulder exercise training program for shoulder rehabilitation based on an app so that the subjects could exercise in the right way and with the right posture. In the future, for OFRE programs, ICT-based self-exercise programs should be developed so that elderly people can perform interventions correctly. In the case of salivary function exercises, low CVR values were observed for the applicability of caregiver education and the applicability of care facility programs. In the case of salivary gland massage, the location of the salivary glands may be difficult to identify for subjects or their caregivers. It is therefore necessary to develop educational materials to compensate for this or programs to perform self-exercises using Information & Communications Technology (ICT).

Based on the clinical experience of the Delphi expert panel and the results of the systematic review, the appropriate number and duration of each intervention domain evaluated were 3 to 4 times per set with 2 sets per day, 3 times per week for 6 to 7 weeks. During the Delphi survey, the experts agreed that it is difficult to determine the appropriate criteria for the number, frequency, and duration of exercises required per session due to the different number and duration of interventions presented in

previous studies and differences in exercise methods. The current literature on oral exercise mainly focuses on the effectiveness of the researcher's designed oral exercise method rather than the effectiveness of the duration and number of exercises. Therefore, there are limitations in synthesizing evidence and comparing and analyzing the appropriate number of exercises due to the high heterogeneity of the number and duration of exercises presented in the literature. In the future, research is needed on the differences in the effectiveness of the appropriate number and duration of exercises as well as long-term observational studies to confirm persistence. on the other hand, unlike other intervention domains, the intervention period for salivation exercise should be longer than 2 months, such as 8 to 9 weeks. According to a previous systematic review of salivation exercise interventions, 7 of the 9 selected studies had an intervention period of at least 8 weeks, and the meta-analysis confirmed significant improvement<sup>24)</sup>. Therefore, it can be concluded that the optimal duration of salivary motor intervention derived from this Delphi survey is a reasonable consensus based on the results of previous studies. To confirm whether the number and duration of interventions agreed upon by experts in this study are indeed significant, it is necessary to plan future randomized controlled clinical studies and verify their effectiveness.

The questionnaire on the appropriateness of dental personnel and dental hygienists as personnel who provide OFREs to elderly people demonstrated a positive response. In Japan, dental hygienists perform a variety of activities for the oral function rehabilitation of elderly people, including home-based rehabilitation, convalescent rehabilitation, acute rehabilitation, community comprehensive care system rehabilitation, and nursing home rehabilitation<sup>25)</sup>. The reason why dental hygienists in Japan are able to provide comprehensive oral function rehabilitation activities is that since the 1990s, there have been policy efforts to gradually implement reimbursement measures for the oral function rehabilitation of elderly people and to secure the expertise of dental hygienists<sup>25)</sup>. The process of policy formulation, institutionalization, and reimbursement can take a very long time<sup>26)</sup>. Therefore, to respond to an ultra-elderly society, there should be active discussions on the establishment of a system to expand the role of dental hygienists in promoting the oral health of elderly people and the related dental fee system. In previous studies on perceptions and practices regarding oral exercises for the older adults, the majority of dental hygienists and dentists had no experience with oral exercises, and if they did, it was mostly conducted on pediatric patients for the purpose of controlling mandibular growth<sup>27)</sup>. Institutionalization

can be further promoted through the interests and activities of the relevant personnel. Therefore, training and promotion efforts such as continuing education and conferences are needed to improve the awareness of dental personnel.

As the world's aging population intensifies, the living arrangements of older people are changing, and efforts are increasing to realize aging in place. In the past, 'institutionalized' older adults were mostly severely ill older people who needed intensive care. The residential type was therefore dichotomized into community-dwelling older adults and institutionalized older adults. As the need for community protection increases, various types of facilities, such as residential care facilities, retirement homes, and community residences, are being developed to improve the independence and quality of life of older adults<sup>28)</sup>. Even if older adults living in the aforementioned housing types are not seriously ill, they use the facilities for care and to improve their personal quality of life. From this perspective, modern institutionalized elderly individuals may not live in their own homes, but they receive care within the community and interact extensively with the outside world, similar to homebound elderly individuals. Therefore, in this study, the older population was not limited to older adults living at home but included older adults whose function status was such that they could perform externally provided OFRE interventions in a facility. Community integrated care aims to enable older adults to live longer and healthier lives in their homes and neighborhoods rather than in institutions. To achieve this goal, it is necessary not only to provide services for elderly people at home but also to provide services and systems in facilities to enable elderly people living in facilities to return to their own homes. The OFREs developed in this study can be used as a basis for developing oral health promotion services to maintain and restore the residual oral function of homebound and institutionalized elderly individuals within the community integrated care system. In addition, this study is expected to contribute to the provision of professional and comprehensive oral health promotion services to the target population through linkages with existing home-based oral care programs.

The limitations of this study include the following. Although this study validated the community applicability of OFREs based on a systematic review and expert Delphi survey, caution should be exercised in interpreting the results because subsequent pragmatic clinical trials are needed to determine whether the intervention is effective in the real world. Nevertheless, the significance of this study is that it validates the applicability of OFRE interventions in the community among dental hygiene professionals and provides a basis for the application of effec-

tive community-based interventions in the future.

Providing information on intervention providers will help to inform the design of future studies, and the accumulated information can be used as a basis for developing education programs for intervention providers. Future studies may include information on intervention providers and a detailed description of their intervention delivery methods. In addition, dental hygienists were the most common personnel in the literature included in this study. Spillane et al.<sup>29)</sup> suggested that intervention manuals and standardized guidelines for intervention providers should be used to improve the reliability and validity of randomized controlled trials. A systematic training program for dental hygienists who deliver interventions may be needed in the future to ensure that consistent and reliable interventions are delivered. This training program could include a certification process to standardize the required competencies for intervention delivery. For example, a structured workshop or course could provide theoretical knowledge on oral function rehabilitation and practical skills training through role-play or supervised practice. Additionally, an annual or biannual recertification program could be implemented to ensure that dental hygienists maintain their skills and stay updated on the latest guidelines and research findings. These measures would enhance the quality and consistency of interventions delivered in clinical and community settings.

## Conclusions

This study validated the community applicability of OFREs for elderly people and confirmed the appropriateness of dental hygienists as providers through a Delphi survey. Strengthening the role and expertise of dental hygienists as OFRE providers is recommended for the future.

## Conflict of Interest

The authors declare no conflict of interest.

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## Supplementary Materials

Supplementary materials can be found via <https://doi.org/10.11149/jkaoh.2024.48.4.201>.



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